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# IS 9974-2 (1981): High pressure sodium vapour lamps, Part 2: Standard lamp data sheets [ETD 23: Electric Lamps and their Auxiliaries]

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IS : 9974 ( Part II ) - 1981

# *Indian Standard* ( Reaffirmed 2002 )

# SPECIFICATION FOR HIGH PRESSURE SODIUM VAPOUR LAMPS

## PART II STANDARD LAMP DATA SHEETS

(First Reprint DECEMBER 1991)

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 6 *September* 1982

# *Indian Standard*

# SPECIFICATION FOR HIGH PRESSURE SODIUM VAPOUR LAMPS

## PART II STANDARD LAMP DATA SHEETS

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# *Indian Standard*

# SPECIFICATION FOR HIGH PRESSURE SODIUM VAPOUR LAMPS

## PART II STANDARD LAMP DATA SHEETS

## 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 23 September 1981, after the draft finalized by the Electric Lamps and Accessories Sectional Committee had been approved by the Electrotechnical Division Council.

**0.2** This standard ( Part II ) has been prepared to cover electrical characteristics for lamps starting and operation of high pressure sodium vapour lamps. Additional information for purposes of design of ballast, luminaires and ignitors, where essential, have also been incorporated. It is hoped that at a later stage it shall be possible to prepare a more detailed standard which will state requirements necessary for safety together with test conditions and procedures for complete testing of these lamps.

**0.3** This standard consists of the following two parts:

Part I General requirements and tests; and

Part II Standard lamp data sheets.

**0.3.1** This standard shall be read in conjunction with Part I of this standard.

**0.4** In the preparation of this standard ( Part II ) assistance has been derived from IEC Pub-662 ( 1980 ) High pressure sodium vapour lamps, issued by the International Electrotechnical Commission.

**0.5** The life expectancy and nominal lumen output of high pressure sodium vapour lamps are under consideration by the committee and would be added at a later date as and when sufficient data are available. However, for the purpose of guidance, the nominal life of such lamps may be taken as 5 000 hours.

**0.6** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## 1. SCOPE

**1.1** This standard ( Part II ) comprises lamp data sheets for high pressure sodium vapour lamps covered by this standard.

## 2. TERMINOLOGY

**2.1** For the purpose of this standard, the definitions given in IS : 9974 ( Part I )-1981† shall apply.

## 3. RECOMMENDED LAMP TYPES

**3.1** The recommended types of high pressure sodium vapour lamps covered by this standard are as follows:

a) 150 W Tubular clear,
b) 150 W Elliptical — diffuse coating,
c) 250 W Tubular clear,
d) 250 W Elliptical — diffuse coating,
e) 400 W Tubular clear, and
f) 400 W Elliptical — diffuse coating.

## 4. LAMP DIMENSIONS CAP AND OTHER DETAILS

**4.1** The overall lamp dimensions, bulb diameter and type of caps that are to be employed in the lamp shall be as given in the relevant data sheet. Schematic drawings for location of lamp dimensions specified in the data sheets have been indicated in Fig. 1 and 2.

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*Rules for rounding off numerical values ( *revised* ).

†Specification for high pressure sodium vapour lamps: Part I General requirements and tests.

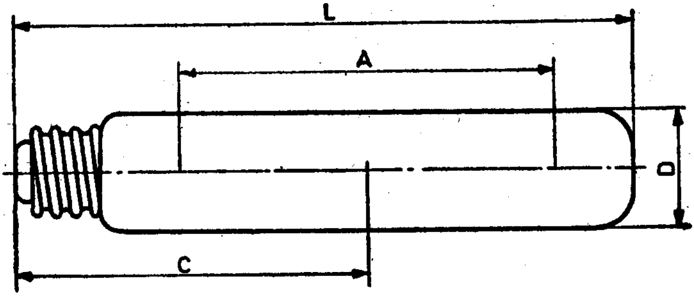


FIG. 1 TUBULAR BULB LAMP

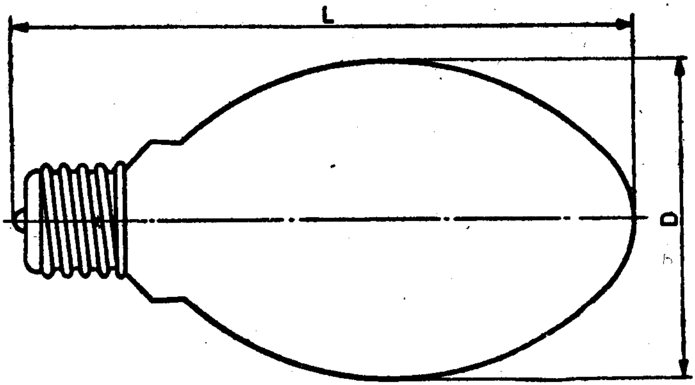


FIG. 2 ELLIPTICAL BULB LAMP

## TECHNICAL DATA SHEET NO. 1
## HIGH PRESSURE SODIUM VAPOUR LAMPS

| RATED WATTAGE : 150 W | BULB : TUBULAR, CLEAR |
|---|---|

### LAMP STARTING TEST

| | |
|---|---|
| Test voltage ( V ) | 198 |
| Maximum starting time ( s ) | 5 |

### PULSE CHARACTERISTICS [ *see* FIG. 1 OF IS : 9974 ( PART I )-1981 ]

| | |
|---|---|
| Height ( V ) | 2 775 ± 25 |
| Waveshape | Sinusoidal |
| Direction | A positive pulse during the positive half-cycle of the rms voltage wave |
| Position | Within 80-90 electrical degrees of the open-circuit voltage |
| Rise time — $T_1$ ( *Max* ) | 0·60 μs |
| Duration time — $T_2$ | 0·95 ± 0·5 μs |
| Repetition rate | One per cycle |

### LAMP WARM-UP TEST

| | |
|---|---|
| Test voltage ( V ) | 198 |
| Time required to reach 50 V minimum at lamp terminals ( *Min* ) | 5 ( *Max* ) |

### LAMP ELECTRICAL CHARACTERISTICS

| | *Objective* | *Maximum* | *Minimum* |
|---|---|---|---|
| Voltage at lamp terminals ( V ) ( rms ) | 100 | 115 | 85 |
| Lamp current ( A ) ( rms ) | 1·8 | — | — |
| Lamp wattage ( W ) | 150 | — | — |
| Test voltage ( V ) | 220 | — | — |

( *Continued* )

Lamp operating limits are shown graphically in Fig. 3.

*Extinguishing voltage* : A lamp when operating on a reference ballast at rated supply voltage and at a lamp voltage of 116 V, achieved if necessary by artificial means, shall not extinguish when the supply voltage falls from 100 percent to 90 percent of the rated value in less than 0·5 s and remains at that value for at least 5 s.

### REFERENCE BALLAST CHARACTERISTICS

| | |
|---|---|
| Rated frequency ( Hz ) | 50 |
| Rated voltage ( V ) | 220 |
| Calibration current ( A ) | 1·8 |
| Voltage/current ratio | 99·0 |
| Power factor | 0·06 ± 0·005 |

### LAMP DIMENSIONS

| *Cap* | *Bulb Dia (Max) D* | *Overall Length (Max) L* | *Light Centre Length C* | *Arc Length (Max) A* | *Deviation of Any Point Along Centre Line of Arc Tube from Axis of Cap ( Apex of Cap Eyelet Used as the Point of Reference )* | *Operating Position Limitation* |
|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | mm | mm | mm | mm | | |
| E40 | 53 | 211 | 127±20 | 58 | Uuder consideration | As indicated by lamp manufacturer |

### BALLAST DESIGN INFORMATION [ *see* 8 OF IS : 9974 ( PART I )-1981 ]

| | *Maximum* | *Minimum* |
|---|---|---|
| Lamp starting current for ballast design ( A ) ( rms ) | 3·0 | 1·8 |
| Pulse height for ignitor design ( kV ) | 4·5 | 2·8 |

### LUMINAIRE DESIGN INFORMATION [ *see* 9 OF IS : 9974 ( PART I )-1981 ]

| | |
|---|---|
| Voltage increase at lamp terminals ( *Max* ) ( V ) | 5 |

# TECHNICAL DATA SHEET NO. 2
# HIGH PRESSURE SODIUM VAPOUR LAMPS

RATED WATTAGE 150 W — BULB: ELLIPTICAL — DIFFUSE COATING

## LAMP STARTING TEST

| | |
|---|---|
| Test voltage ( V ) | 198 |
| Maximum starting time (s) | 5 |

## PULSE CHARACTERISTICS [ *see* FIG. 1 OF IS : 9974 ( PART I )-1981 ]

| | |
|---|---|
| **Height ( V )** | 2 775±25 |
| **Waveshape** | Sinusoidal |
| **Direction** | A position pulse during the positive half-cycle of the rms voltage wave |
| **Position** | Within 80-90 electrical degrees of the open-circuit voltage |
| **Rise time — $T_1$ ( *Max* )** | 0·60 μs |
| **Duration time — $T_2$** | 0·95±0·5 μs |
| **Repetition rate** | One per cycle |

## LAMP WARM-UP TEST

| | |
|---|---|
| **Test voltage ( V )** | 198 |
| **Time required to reach 50 V minimum at lamp terminals ( *Min* )** | 5 ( *Max* ) |

## LAMP ELECTRICAL CHARACTERISTICS

| | *Objective* | *Maximum* | *Minimum* |
|---|---|---|---|
| Voltage at lamp terminals ( V ) ( rms ) | 100 | 115 | 85 |
| Lamp current ( A ) ( rms ) | 1·8 | — | — |
| Lamp wattage ( W ) | 150 | — | — |
| Test voltage ( V ) | 220 | — | — |

( *Contiuued* )

Lamp operating limits are shown graphically in Fig. 3.

*Extinguishing voltage* : A lamp when operating on a reference ballast at rated supply voltage and a lamp voltage of 116 V, achieved if necessary by artificial means, shall not extinguish when the supply voltage falls from 100 percent to 90 percent of the rated value in less than 0·5 s and remains at that value for at least 5 s.

### REFERENCE BALLAST CHARACTERISTICS

| | |
|---|---|
| Rated frequency ( Hz ) | 50 |
| Rated voltage ( V ) | 220 |
| Calibration current ( A ) | 1·8 |
| Voltage/current ratio | 99·0 |
| Power factor | 0·06±0·005 |

### LAMP DIMENSIONS

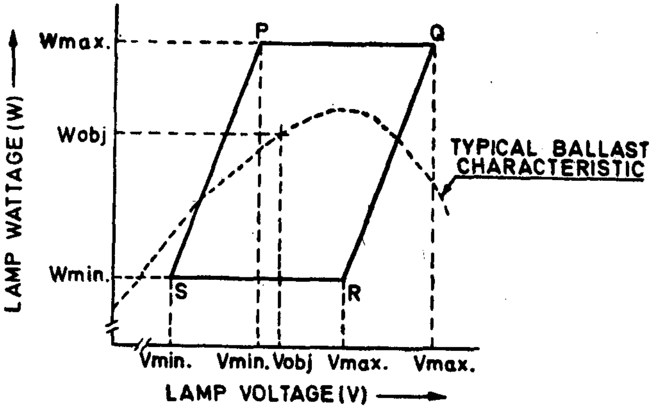
| *Cap* | *Bulb Dia ( Max ) D* | *Overall Length ( Max ) L* | *Light Centre Length C* | *Arc Length A* | *Deviation of Any Point Along Centre Line of Arc Tube from Axis of Cap ( Apex of Cap Cyelet ) Used as the Point of Reference* | *Operating Position Limitation* |
|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | mm | mm | mm | mm | | |
| E40 | 91 | 227 | — | — | Under consideration | As indicated by lamp manufacturer |

### BALLAST DESIGN INFORMATION [ *see* 8 OF IS : 9974 ( PART I )-1981 ]

| | *Maximum* | *Minimum* |
|---|---|---|
| Lamp starting current for ballast design ( A ) ( rms ) | 3·0 | 1·8 |
| Pulse height for ignitor design ( kV ) | 4·5 | 2·8 |

### LUMINAIRE DESIGN INFORMATION [ *see* 9 OF IS : 9974 ( PART I )-1981 ]

| | |
|---|---|
| Voltage increase at lamp terminals ( *Max* ) ( V ) | 5 |



The characteristic curve of a ballast, at any supply voltage between 95% and 105% of rated voltage, shall be within the above limits ( *see* **8.5** of Part I of this standard ).

A typical ballast characteristic curve at rated supply voltage is shown by the dotted line in diagram.

| *Rated Wattage* | *Objective Lamp V* | *Maximum Lamp W* | *Minimum Lamp W* | *Maximum Lamp V* | *Minimum Lamp V* |
|---|---|---|---|---|---|
| 150 W Tubular | 100 | 187 | 105 | 103 to 175 | 73 to 113 |
| 150 W Elliptical | 100 | 187 | 105 | 103 to 175 | 73 to 113 |

FIG. 3 LAMP OPERATING LIMITS FOR THE INFORMATION OF BALLAST DESIGN ( 150 W LAMP — TUBULAR CLEAR AND ELLIPTICAL DIFFUSE COATING BULBS )

# TECHNICAL DATA SHEET NO. 3
# HIGH PRESSURE SODIUM VAPOUR LAMPS

| | |
|---|---|
| RATED WATTAGE : 250 W | BULB : TUBULAR, CLEAR |

## LAMP STARTING TEST

| | |
|---|---|
| Test voltage ( V ) | 198 |
| Maximum starting time (s) | 5* |

*In the case of lamps with internal starters this requirement shall be 5 s after the internal starter has opened.

## PULSE CHARACTERISTICS [ *see* FIG. 1 OF IS : 9974 ( PART I )-1981 ]

| | |
|---|---|
| Height ( V ) | 2 775 ± 25 |
| Waveshape | Sinusoidal |
| Direction | A positive pulse during the positive half cycle of the rms voltage wave |
| Position | Within 80-90 electrical degrees of the open circuit voltage |
| Rise time — $T_1$ ( *Max* ) | 0·60 µs |
| Duration time — $T_2$ | 0·95 ± 0·05 µs |
| Repetition rate | One per cycle |

## LAMP WARM-UP TEST

| | |
|---|---|
| Test voltage ( V ) | 198 |
| Time required to reach 50 V minimum at lamp terminals ( *Min* ) | 5 ( *Max* ) |

## LAMP ELECTRICAL CHARACTERISTICS

| | *Objective* | *Maximum* | *Minimum* |
|---|---|---|---|
| Voltage at lamp terminals ( V ) ( rms ) | 100 | 115 | 85 |
| Lamp current ( A ) ( rms | 3·0 | — | — |
| Lamp wattage ( W ) | 250 | — | — |

( *Continued* )

Lamp operating limits are shown graphically in Fig. 4.

*Extinguishing Voltage* : A lamp when operating on a reference ballast at rated supply voltage and at a lamp voltage of 120 V, achieved if necessary by artificial means, shall not extinguish when the supply voltage falls from 100 percent to 90 percent of the rated value in less than 0·5 s and remains at that value for at least 5 s.

---

### REFERENCE BALLAST CHARACTERISTICS

| | |
|---|---|
| Rated frequency ( Hz ) | 50 |
| Rated voltage ( V ) | 220 |
| Calibration current ( A ) | 3·0 |
| Voltage/current ratio | 60·0 |
| Power factor | 0·06±0·005 |

### LAMP DIMENSIONS

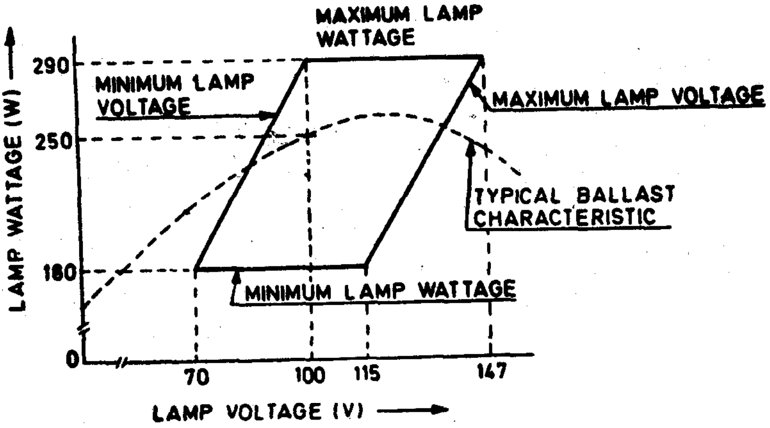
| *Cap* | *Bulb Dia ( Max ) D* | *Overall Length ( Max ) L* | *Light Centre Length C* | *Arc Length A* | *Deviation of Any Point Along Centre Line of Arc Tube from Axis of Cap ( Apex of Cap Eyelet Used as the Point of Reference )* | *Operating Position Limitation* |
|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | mm | mm | mm | mm | | |
| E40 | 60 | 260 | 152±20 | 65 nominal | 3 degrees | As indicated by lamp manufacturer |

### BALLAST DESIGN INFORMATION [ *see* 8 OF IS : 9974 ( PART I )-1981 ]

| | *Maximum* | *Minimum* |
|---|---|---|
| Lamp warm-up current for ballast design ( A ) ( rms ) | 5·2 | 3·0 |
| Pulse height for ballast design ( kV ) | 4·5 | 2·8 |

### LUMINAIRE DESIGN INFORMATION [ *see* 9 OF IS : 9974 ( PART I )-1981 ]

| | |
|---|---|
| Voltage increase at lamp terminals ( *Max* ) ( V ) | 10 |



The characteristic curve of a ballast, at any supply voltage between 95% and 105% of rated voltage, shall be within the above limits ( *see* **8.5** of Part I of this standard ).

A typical ballast characteristic curve at rated supply voltage is shown by the dotted line in the diagram.

FIG. 4 LAMP OPERATING LIMITS FOR THE INFORMATION OF BALLAST DESIGN ( 250 W LAMP — TUBULAR CLEAR BULB )

## TECHNICAL DATA SHEET NO. 4
## HIGH PRESSURE SODIUM VAPOUR LAMPS

| RATED WATTAGE: 250 W | BULB : ELLIPTICAL — DIFFUSE COATING |
|---|---|

### LAMP STARTING TEST

| | |
|---|---|
| Test voltage ( V ) | 198 |
| Maximum starting time (s) | 5* |

*In the case of lamps with internal starters this requirement shall be 5 s after the internal starter has opened.

### PULSE CHARACTERISTICS [ *see* FIG. 1 OF IS : 9974 ( PART I )-1981 ]

| | |
|---|---|
| Height ( V ) | 2 775±25 |
| Waveshape | Sinusoidal |
| Direction | A positive pulse during the positive half-cycle of the rms voltage wave |
| Position | Within 80-90 electrical degrees of the open circuit voltage |
| Rise time — $T_1$ ( *Max* ) | 0·60 μs |
| Duration time — $T_2$ | 0·95±0·05 μs |
| Repetition rate | One per cycle |

### LAMP WARM-UP TEST

| | |
|---|---|
| Test voltage ( V ) | 198 |
| Time required to reach 50 V minimum at lamp terminals ( *Min* ) | 5 ( *Max* ) |

### LAMP ELECTRICAL CHARACTERISTICS

| | *Objective* | *Maximum* | *Minimum* |
|---|---|---|---|
| Voltage at lamp terminals ( V ) ( rms ) | 100 | 115 | 85 |
| Lamp current ( A ) ( rms ) | 3·0 | — | — |
| Lamp wattage ( W ) | 250 | — | — |

( *Continued* )

Lamp operating limits are shown graphically in Fig. 5.

*Extinguishing Voltage* : A lamp when operating on a reference ballast at rated supply voltage and at a lamp voltage of 120 V, achieved if necessary by artificial means, shall not extinguish when the supply voltage falls from 100 percent to 90 percent of the rated value in less than 0·5 s and remains at that value for at least 5 s.

### REFERENCE BALLAST CHARACTERISTICS

| | |
|---|---|
| Rated frequency ( Hz ) | 50 |
| Rated voltage ( V ) | 220 |
| Calibration current ( A ) | 3·0 |
| Voltage/current ratio | 60·0 |
| Power factor | 0·06±0·005 |

### LAMP DIMENSIONS

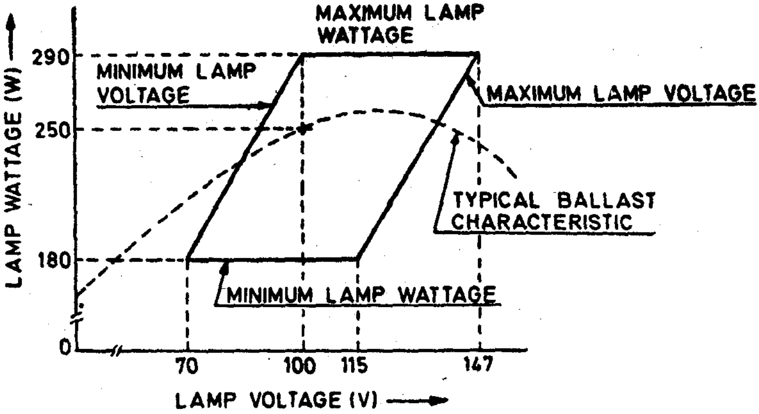
| *Cap* | *Bulb Dia ( Max ) D* | *Overall Length ( Max ) L* | *Light Centre Length C* | *Arc Length A* | *Deviation of Any Point Along Centre Line of Arc Tube from Axis of Cap ( Apex of Cap Eyelet Used as the Point of Reference )* | *Operating Position Limitation* |
|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | mm | mm | mm | mm | | |
| E40 | 91 | 227 | — | — | — | As indicated by lamp manufacturer |

### BALLAST DESIGN INFORMATION [ *see* 8 OF IS : 9974 ( PART I )-1981 ]

| | *Maximum* | *Minimum* |
|---|---|---|
| Lamp warm-up current for ballast design ( A ) ( rms) | 5·2 | 3·0 |
| Pulse height for ballast design ( kV ) | 4·5 | 2·8 |

### LUMINAIRE DESIGN INFORMATION [ *see* 9 OF IS : 9974 ( PART I )-1981 ]

| | |
|---|---|
| Voltage increase at lamp terminals ( *Max* ) ( V ) | 10 |



The characteristic curve of a ballast, at any supply voltage between 95% and 105% of rated voltage, shall be within the above limits ( *see* 8.5 of Part I of this standard ).

A typical ballast characteristic curve at rated supply voltage is shown by the dotted line in the diagram.

FIG. 5 LAMP OPERATING LIMITS FOR THE INFORMATION OF BALLAST DESIGN ( 250 W LAMP — ELLIPTICAL DIFFUSE COATING BULB )

## TECHNICAL DATA SHEET NO. 5
## HIGH PRESSURE SODIUM VAPOUR LAMPS

---

RATED WATTAGE : 400 W — BULB : TUBULAR, CLEAR

### LAMP STARTING TEST

| | |
|---|---|
| Test voltage ( V ) | 198 |
| Maximum starting time (s) | 5* |

*In the case of lamps with internal starters this requirement shall be 5 s after the internal starter has opened.

---

### PULSE CHARACTERISTICS [ *see* FIG. 1 OF IS : 9974 ( PART I )-1981 ]

| | |
|---|---|
| Height ( V ) | 2 775±25 |
| Waveshape | Sinusoidal |
| Direction | A positive pulse during the positive half-cycle of the rms voltage wave |
| Position | Within 80-90 electrical degrees of the open-circuit voltage |
| Rise time — $T_1$ ( *Max* ) | 0·60 μs |
| Duration time — $T_2$ | 0·95±0·05 μs |
| Repetition rate | One per cycle |

---

### LAMP WARM-UP TEST

| | |
|---|---|
| Test voltage ( V ) | 198 |
| Time required to reach 50 V minimum at lamp terminals ( *Min* ) | 4 ( *Max* ) |

---

### LAMP ELECTRICAL CHARACTERISTICS

| | *Objective* | *Maximum* | *Minimum* |
|---|---|---|---|
| Voltage at lamp terminals ( V ) ( rms ) | 100 | 117 | 74 |
| Lamp current ( A ) ( rms ) | 4·6 | — | — |
| Lamp wattage ( W ) | 392 | — | — |

( *Continued* )

Lamp operating limits are shown graphically in Fig. 6.

*Extinguishing Voltage* : A lamp when operating on a reference ballast at rated supply voltage and at a lamp voltage of 120 V, achieved if necessary by artificial means, shall not extinguish when the supply voltage falls from 100 percent to 90 percent of the rated value in less than 0·5 s and remains at that value for at least 5 s.

### REFERENCE BALLAST CHARACTERISTICS

| | |
|---|---|
| Rated frequency ( Hz ) | 50 |
| Rated voltage ( V ) | 220 |
| Calibration current ( A ) | 4·6 |
| Voltage/current ratio | 39·0 |
| Power factor | 0·06 ± 0·005 |

### LAMP DIMENSIONS

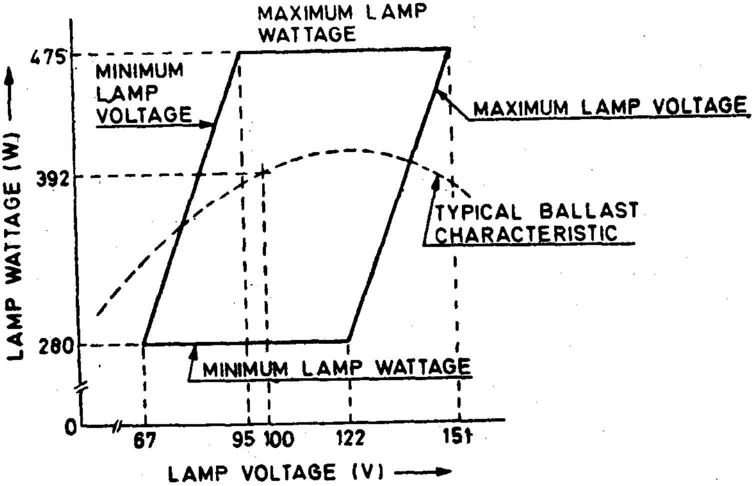
| *Cap* (1) | *Bulb Dia ( Max ) D* (2) mm | *Overall Length ( Max ) L* (3) mm | *Light Centre Length C* (4) mm | *Arc Length A* (5) mm | *Deviation of Any Point Along Centre Line of Arc Tube from Axis of Cap ( Apex of Cap Eyelet Used as the Point of Reference )* (6) | *Operating Position Limitation* (7) |
|---|---|---|---|---|---|---|
| E40 | 60 | 292 | 163 ± 20 | 85 ± 5 | 3 degrees | As indicated by lamp manufactures |

### BALLAST DESIGN INFORMATION [ *see* 8 OF IS : 9974 ( PART I )-1981 ]

| | *Maximum* | *Minimum* |
|---|---|---|
| Lamp warm-up current for ballast design ( A ) ( rms ) | 7·5 | 4·6 |
| Pulse height for ballast design ( kV ) | 4·5 | 2·8 |

### LUMINAIRE DESIGN INFORMATION [ *see* 9 OF IS : 9974 ( PART I )-1981 ]

| | |
|---|---|
| Voltage increase at lamp terminals ( *Max* ) ( V ) | 12 |



The characteristic curve of a ballast, at any supply voltage between 95% and 105% of rated voltage, shall be within the above limits ( *see* **8.5** of Part I of this standard ).

A typical ballast characteristic curve at rated supply voltage is shown by the dotted line in the diagram.

FIG. 6 LAMP OPERATING LIMITS FOR THE INFORMATION OF BALLAST DESIGN ( 400 W LAMP — TUBULAR CLEAR BULB )

## TECHNICAL DATA SHEET NO. 6
## HIGH PRESSURE SODIUM VAPOUR LAMPS

RATED WATTAGE : 400 W — BULB : ELLIPTICAL — DIFFUSE COATING

### LAMP STARTING TEST

| | |
|---|---|
| Test voltage ( V ) | 198 |
| Maximum starting time ( s ) | 5* |

*In the case of lamps with internal starters this requirement shall be 5 s after the internal starter has opened.

### PULSE CHARACTERISTICS [ *see* FIG. 1 OF IS : 9974 ( PART I )-1981 ]

| | |
|---|---|
| Height | 2 775 ± 25 |
| Waveshape | Sinusoidal |
| Direction | A positive pulse during the positive half-cycle of the rms voltage wave |
| Position | Within 80-90 electrical degrees of the open-circuit voltage |
| Rise time — $T_1$ ( *Max* ) | 0·60 μs |
| Duration time — $T_2$ | 0·95 ± 0·05 μs |
| Repetition rate | One per cycle |

### LAMP WARM-UP TEST

| | |
|---|---|
| Test voltage ( V ) | 198 |
| Time required to reach 50 V minimum at lamp terminals ( *Min* ) | 4 ( *Max* ) |

### LAMP ELECTRICAL CHARACTERISTICS

| | *Objective* | *Maximum* | *Minimum* |
|---|---|---|---|
| Voltage at lamp terminals ( V ) ( rms ) | 105 | 120 | 90 |
| Lamp current ( A ) ( rms ) | 4·45 | — | — |
| Lamp wattage ( W ) | 400 | — | — |

( *Continued* )

Lamp operating limits are shown graphically in Fig. 7.

*Extinguishing Voltage* : A lamp when operating on a reference ballast at rated supply voltage and at a lamp voltage of 125 V, achieved if necessary by artificial means, shall not extinguish when the supply voltage falls from 100 percent to 90 percent of the rated value in less than 0·5 s and remains at that value for at least 5 s.

### REFERENCE BALLAST CHARACTERISTICS

| | |
|---|---|
| Rated frequency ( Hz ) | 50 |
| Rated voltage ( V ) | 220 |
| Calibration current ( A ) | 4·6 |
| Voltage/current ratio | 39·0 |
| Power factor | 0·06 ± 0·005 |

### LAMP DIMENSIONS

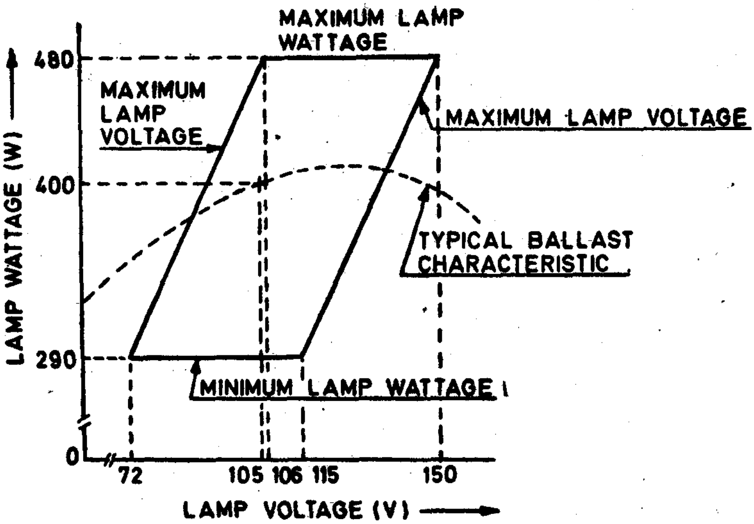
| *Cap* | *Bulb Dia ( Max ) D* | *Overall Length ( Max ) L* | *Light Centre Length C* | *Arc Length A* | *Deviation of Any Point Along Centre Line of Arc Tube from Axis of Cap ( Apex of Cap Eyelet Used as the Point of Reference )* | *Operating Position Limitation* |
|---|---|---|---|---|---|---|
| (1) | (2) mm | (3) mm | (4) mm | (5) mm | (6) | (7) |
| E40 | 122 | 292 | — | — | — | As indicated by lamp manufacturer |

### BALLAST DESIGN INFORMATION [ *see* 8 OF IS : 9974 ( PART I )-1981 ]

| | *Maximum* | *Minimum* |
|---|---|---|
| Lamp starting current for ballast design ( A ) ( rms ) | 7·5 | 4·6 |
| Pulse height for ballast design ( kV ) | 4·5 | 2·8 |

### LUMINAIRE DESIGN INFORMATION [ *see* 9 OF IS : 9974 ( PART I )-1981 ]

| | |
|---|---|
| Voltage increase at lamp terminals ( *Max* ) ( V ) | 7 |



The characteristic curve of a ballast, at any supply voltage between 95% and 105% of rated voltage, shall be within the above limits ( *see* 8.5 of Part I of this standard ).

A typical ballast characteristic curve at rated supply voltage is shown by the dotted line in the diagram.

FIG. 7 LAMP OPERATING LIMITS FOR THE INFORMATION OF BALLAST DESIGN ( 400 W LAMP — ELLIPTICAL DIFFUSE COATING BULB )

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# AMENDMENT NO. 1 MARCH 1989

# TO

# IS : 9974 (Part 2) - 1981 SPECIFICATION FOR HIGH PRESSURE SODIUM VAPOUR LAMPS

## PART 2 STANDARD LAMP DATA SHEETS

( *Pages* 6 *and* 8, *Technical Data Sheet No.* 1 *and* 2 ) — Insert the following data in these sheets:

LUMINOUS FLUX

| *Rated Wattage* | *Rated Luminous Flux* ( lumens ) |
|---|---|
| (1) | (2) |
| 150 W | 12 150 |

( *Pages* 11 *and* 14, *Technical Data Sheet No.* 3 *and* 4 ) — Insert the following data in these sheets:

LUMINOUS FLUX

| *Rated Wattage* | *Rated Luminous Flux* ( lumens ) |
|---|---|
| (1) | (2) |
| 250 W | 22 500 |

( *Pages* 17 *and* 20, *Technical Data Sheet No.* 5 *and* 6 ) — Insert the following data in these sheets:

LUMINOUS FLUX

| *Rated Wattage* | *Rated Luminous Flux* ( lumens ) |
|---|---|
| (1) | (2) |
| 400 W | 42 300 |

( ETDC 23 )

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# AMENDMENT NO. 2 AUGUST 1990
## TO
# IS 9974 ( Part 2 ) : 1981 SPECIFICATION FOR HIGH PRESSURE SODIUM VAPOUR LAMPS

## PART 2 STANDARD LAMP DATA SHEETS

( *Page* 4, *clause* 3.1 ) — Insert the following at the end:

'g) 70 W Tubular clear

h) 70 W Elliptical bulb — diffuse coating clear'

( *Page* 22, *Technical Data Sheet No.* 6 ) — Insert the following data sheets No. 7 and 8 at the end.

### TECHNICAL DATA SHEET NO. 7
### HIGH PRESSURE SODIUM VAPOUR LAMPS

RATED WATTAGE : 70 W FOR USE WITH EXTERNAL IGNITOR TUBULAR BULB — CLEAR

LAMP STARTING TEST

| | |
|---|---|
| Test voltage (V) | 198 |
| Maximum starting time (s) | 10 |

PULSE CHARACTERISTICS [ *see* FIG. 1 OF IS : 9974 ( Part 1) - 1981]

| | |
|---|---|
| Height ( V ) | 1 775 ± 25* |
| Waveshape | Sinusoidal* |
| Direction | A positive pulse during the positive half cycle and a negative pulse during the negative half cycle of the rms voltage wave† |
| Position | 90 and 270 electrical degrees of open circuit voltage |
| Rise time — $T_1$ *Max* | 1·00 µs* |
| Duration time — $T_2$ | 1·95 ± 0·05 µs* |
| Repetition rate | One per each half cycle |

*These values are based on the assumption that this sinusoidal pulse will give starting results equivalent to a rectangular pulse of 1 775 ± 25 V, very short rise time and a duration time of 1·95 ± 0·05 µs. This matter is under investigation together with further details concerning the measuring circuit.

†The starting device used for the specified lamp starting test shall supply a pulse current of 1·8 ± 0·2 A and shall not allow pulse current reversal.

LAMP WARM-UP TEST

| | |
|---|---|
| Test voltage ( V ) | 198 |
| Maximum time required to reach 50 V minimum at lamp terminals ( *Min* ) | 7 |

| LAMP ELECTRICAL CHARACTERISTICS ( AT RATED VOLTAGE OF REFERENCE BALLAST ) | *Objective* | *Maximum* | *Minimum* |
|---|---|---|---|
| Voltage at lamp terminals ( V ) ( rms ) | 90 | 105 | 75 |
| Lamp current ( A ) ( rms ) | 0·98 | — | — |
| Lamp wattage ( W ) | 70 | — | — |
| Extinguishing voltage at lamp terminals ( V ) ( rms ) | 105 | — | — |
| Rated luminous flux ( lumens ) | 5 200 | — | — |

| REFERENCE BALLAST CHARACTERISTICS | |
|---|---|
| Rated frequency ( Hz ) | 50 |
| Rated voltage ( V ) | 220 |
| Calibration current ( A ) | 0·98 |
| Voltage/current ratio | 188 |
| Power factor | 0·075 ± 0·005 |

LAMP DIMENSIONS ( *see* FIG. 1 )

| *Cap* | *Bulb Diameter ( Max )* D | *Overall Length ( Max )* L | *Light Centre Length* C | *Arc Length* A | *Deviation of Any Point Along Centre Line of Arc Tube from Axis of Cap ( Apex of Cap Eyelet Used as the Point of Reference )* | *Operating Position Limitation* |
|---|---|---|---|---|---|---|
| (1) | (2) mm | (3) mm | (4) mm | (5) mm | (6) | (7) |
| E27 | 38·5 | 156 | 105±10 | 28-45 | — | As indicated by lamp manufacturer |

| BALLAST DESIGN INFORMATION [ *see* 8 OF IS : 9974 ( Part 1 ) - 1981 ] | *Maximum* | *Minimum* |
|---|---|---|
| Lamp warm-up current for ballast design ( A ) ( rms ) | 1·96 | 0·98 |
| Pulse height for ballast design ( V ) | 2 300 | *see* Note |

NOTE — There are two designs of lamp presently in use which are compatible in operation, but which require different starting conditions.

Some lamp designs require a minimum pulse height of 1 600 V whereas other designs require a minimum pulse height of 1 800 V. Information is to be provided by the lamp manufacturer as to which ignitor pulse height and width are appropriate.

For future starting compatibility of both lamp types, it is recommended that ignitors are designed with a minimum pulse height of 1 800 V.

LUMINAIRE DESIGN INFORMATION [ *see* 9 OF IS : 9974 ( Part 1 ) - 1981 ]

| | |
|---|---|
| Voltage increase at lamp terminals ( *Max* ) ( V ) | 5 |

## TECHNICA DATA SHEET NO. 8
## HIGH PRESSURE SODIUM VAPOUR LAMPS

RATED WATTAGE : 70 W HV FOR USE WITH EXTERNAL IGNITOR
BULB: ELLIPTICAL — DIFFUSE COATING — CLEAR

### LAMP STARTING TEST

| | |
|---|---|
| Test voltage ( V ) | 198 |
| Maximum starting time (s) | 10 |

### PULSE CHARACTERISTICS

| | |
|---|---|
| Height ( V ) | 1 775 ± 25* |
| Waveshape | Sinusoidal* |
| Direction | A positive pulse during the positive half cycle and a negative pulse during the negative half cycle of the rms voltage wave† |
| Position | 90 and 270 electrical degrees of the open circuit voltage |
| Rise time — $T_1$ *Max* | 1·00 µs* |
| Duration time — $T_2$ | 1·95 ± 0·05 µs* |
| Repetition rate | One per each half cycle |

*These values are based on the assumption that this sinusoidal pulse will give starting results equivalent to a rectangular pulse of 1 775 ± 25 V, very short rise time and a duration time of 1·95 ± 0·05 µs. This matter is under investigation together with further details concerning the measuring circuit.

†The starting device used for the specified lamp starting test shall supply a pulse current of 1·8 ± 0·2 A and shall not allow pulse current reversal.

### LAMP WARM-UP TEST

| | |
|---|---|
| Test voltage ( V ) | 198 |
| Maximum time required to reach 50 V minimum at lamp terminals ( *Min* ) | 7 |

### LAMP ELECTRICAL CHARACTERISTICS : AT RATED VOLTAGE

| | *Objective* | *Maximum* | *Minimum* |
|---|---|---|---|
| Voltage at lamp terminals ( V ) ( rms ) | 90 | 105 | 75 |
| Lamp current ( A ) ( rms ) | 0·98 | — | — |
| Lamp wattage ( W ) | 70 | — | — |
| Extinguishing voltage at lamp terminals ( V ) ( rms ) | 105 | — | — |
| Rated luminous flux ( lumens ) | 5 200 | — | — |

### REFERENCE BALLAST CHARACTERISTICS

| | |
|---|---|
| Rated frequency ( Hz ) | 50 |
| Rated voltage ( V ) | 220 |
| Calibration current ( A ) | 0·98 |
| Voltage/current ratio | 188 |
| Power factor | 0·075 ± 0·005 |

### LAMP DIMENSIONS ( *see* FIG. 2 )

| *Cap* | *Bulb Diameter ( Max )* *D* | *Overall Length ( Max )* *L* | *Light Centre Length* *C* | *Arc Length* *A* | *Deviation of Any Point Along Centre Line of Arc Tube from Axis of Cap ( Apex of Cap Eyelet Used as the Point of Reference )* | *Operating Position Limitation* |
|---|---|---|---|---|---|---|
| (1) | (2) mm | (3) mm | (4) mm | (5) mm | (6) | (7) |
| E27 | 72 | 165 | 105 ±10* | 28-45 | — | As indicated by lamp manufacturer |

*Clear finish only.

### BALLAST DESIGN INFORMATION [ *see* 8 OF IS : 9974 ( Part 1 ) - 1981 ]

| | *Max* | *Min* |
|---|---|---|
| Lamp warm-up current for design ( A ) ( rms ) | 1·96 | 0·98 |
| Pulse height for ballast design ( V ) | 2 300 | *see* Note |

NOTE — There are two designs of lamp presently in use which are compatible in operation but which require different starting conditions.

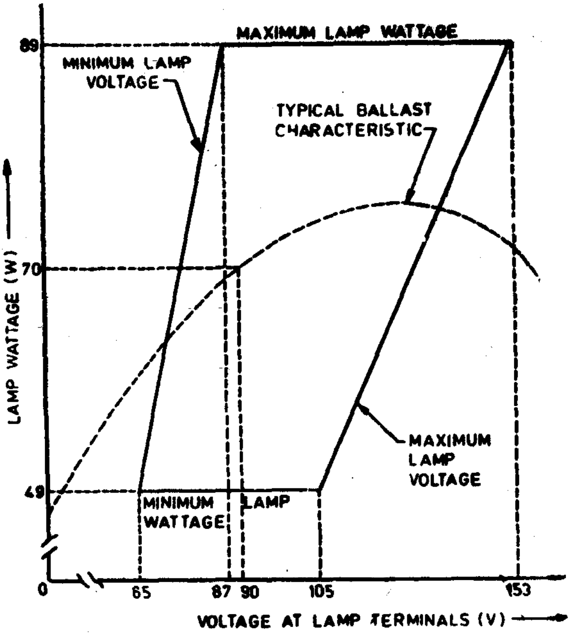
Some lamp designs require a minimum pulse height of 1 600 V whereas other designs require a minimum pulse height of 1 800 V. Information is to be provided by the lamp manufacturer as to which ignitor pulse height and width are appropriate.

For future starting compatibility of both lamp types is recommended that ignitors are designed with a minimum pulse height of 1 800 V.

| LUMINAIRE DESIGN INFORMATION [ *see* 9 OF IS : 9974 ( Part 1 ) - 1981 ] | |
|---|---|
| Voltage increase at lamp terminals ( *Max* ) ( V ) | 5 |

**Rated Wattage** 70 W

NOTE — Lamp operating limits are shown graphically in Fig. 8.



The characteristic curve of a ballast, at any supply voltage between 95 percent and 105 percent of rated voltage, shall lie within the above limits ( *see* 8.5 of Part 1 of this standard ).

A typical ballast characteristic at rated supply voltage is shown by the dotted line in the diagram.

FIG. 8 LAMP OPERATING LIMITS FOR THE INFORMATION OF BALLAST DESIGN ( 70 W LAMP TUBULAR BULB AND ELLIPTICAL DIFFUSE COATING )

( ETDC 23 )

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